POTOMAC RIVER FEDERAL NAVIGATION PROJECT
MAINTENANCE DREDGING
ENVIRONMENTAL ASSESSMENT

August 1999

Prepared by U.S. Army Corps of Engineers – Baltimore District

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EXECUTIVE SUMMARY

Maintenance dredging of Federal navigation projects in the Potomac River has not been performed since 1965. Because this dredging occurred before the implementation of the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA), NEPA documentation specific to the proposed project has not been accomplished. The proposed action calls for maintenance dredging of two channel segments of the *Potomac River below Washington, D.C.* project, and maintenance dredging of the *Potomac River at Alexandria, Virginia* project, with placement of the material in open water in a deep hole near Gunston Cove. The dredging segments are known informally as Alexandria Waterfront, Hunting Creek Bar, and Mattawoman Bar (Figure 1, Appendix C). A total of approximately 7 miles of channel will be dredged. The channel is authorized to 24 feet deep and 200 feet wide in these locations. Material will be removed to the project depth of 24 feet Mean Lower Low Water (MLLW) plus a 0.5-foot of allowable overdepth from each segment. Approximately 564,000 cubic yards (cy) of material will be dredged: 104,000 cy from Alexandria Waterfront, 96,000 cy from Hunting Creek Bar, and 364,000 cy from Mattawoman Bar. The material from Alexandria Waterfront and Mattawoman Bar is primarily fine-grained, cohesive sediment, and the material from Hunting Creek Bar is primarily fine-grained, cohesive sediment with fine-grained sand. The material will be removed by mechanical dredge and placed in a naturally occurring 35- to 50-foot-deep hole at Gunston Cove (Figure 1). The material from Alexandria Waterfront and Mattawoman Bar will be placed first, then covered with the slightly heavier material from Hunting Creek Bar. It is anticipated that dredging will occur between October 1 and February 15. Placement at Gunston Cove will be a one-time event and will be managed to optimize fish habitat. Monitoring of the placement site will take place before, during, and after the placement of dredged material.

Actions Analyzed

The proposed action includes the dredging of portions of the Potomac River Federal Navigation Channel in Washington, D.C., and Maryland. Additional alternatives analyzed include the no action alternative, the placement of the dredged material at alternative locations including upland placement sites, the use of an alternative dredging method, and the use of an alternative placement method.

The no action alternative involves no action at the project site. The Federal Navigation Channel would continue to shoal. This would continue to restrict larger commercial watercraft navigating in the Potomac River up to Alexandria to an 18-foot draft, and over time, would reduce the draft of vessels below 18 feet as shoaling continues.

The placement site alternatives involve placement of the dredged material at other locations. Other sites are divided into categories: upland placement sites, beneficial use sites, and open-water placement sites. Upland sites include traditional placement of sediments as fill material and beneficial use as soil augmentation. Beneficial uses include wetland creation, enhancement,

and island enlargement for the creation of wildlife habitat. Open-water placement is limited to traditional open-water placement of sediments.

Environmental and Socio-Economic Consequences

Anticipated short-term effects of the proposed action include minor air emissions due to operation of dredging equipment, burial of existing sediments at the material placement site, minor and temporary turbidity in the immediate area of dredging and placement, temporary displacement of fish species, removal of sessile aquatic organisms from the channel, and a minor temporary increase in noise due to operation of barges and dredge. No significant long-term negative impacts were identified. Long-term positive impacts include improved navigation from Indian Head to the Alexandria Waterfront and potential improvements to fish habitat. It is anticipated, based on Corps engineering analysis, that the placement of sediment within Gunston Cove will form cohesive mounds, thus enhancing fish habitat, and turbidity resulting from sediment deposition will be temporary.

Environmental investigation of the proposed placement site indicates that no shortnose sturgeon (SNS) are found in that area of the Potomac River, and no other fish species use the site preferentially for overwintering. The proposed work has been coordinated with the Environmental Protection Agency, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and state resource agencies. National Marine Fisheries Service has concurred that the project will cause no impacts to endangered species. Monitoring of the placement site for sediment spread, fish utilization, benthic recolonization, and water quality will be conducted.

Regulatory Requirements

Compliance with Federal environmental regulations is required before the project analyzed in this EA can be initiated. The status of environmental compliance is summarized in Table ES-2.

The dredging contractor will be responsible for adherence to all applicable Federal, State, and local laws and regulations governing dredging and related activities.

An analysis has been performed pursuant to the EPA 404(b)(1) guidelines, which is required any time there is an action that is regulated under Section 404 of the Clean Water Act (CWA). In the proposed action, the open-water placement within the Waters of the United States is an evaluated activity under Section 404 of the CWA.

Conclusions

It is anticipated that the effects of the proposed project are not significant either individually, or as part of a cumulative effect with other actions.

Table ES-1 Summary of Effects of Proposed Actions and Alternatives		
Resource	**Proposed Action**	**No-Action Alternative**
Setting	No Effect	No Effect
Air Quality	Minor emissions due to operation of dredge and related equipment (mobile sources).	No Effect
Geology And Soils	No Effect	No Effect
Water Quality	Minor, short-term turbidity at dredging and placement sites	No Effect
Aquatic Resources and SAV	Minor and temporary turbidity in the immediate area of dredging and placement, temporary displacement of fish species, removal of sessile aquatic organisms from the channel, and burial of sessile organisms at the placement site.	No Effect
Coastal Zone Management	No Effect	No Effect
Wild And Scenic Rivers	No Effect	No Effect
Prime And Unique Farmlands	No Effect	No Effect
Terrestrial Resources	No Effect	No Effect
Wildlife	No Effect	No Effect
Threatened And Endangered Species	No Effect	No Effect
Land Use	No Effect	No Effect
Emergency And Medical Services	No Effect	No Effect
Population	No Effect	No Effect
Environmental Justice	No Effect	No Effect
Recreational Facilities	Improved navigation into Potomac River and Alexandria. Temporary and minor impacts to Recreational fisherman.	Eventual siltation of channels, making them unusable by larger ships.
Transportation And Traffic	Dredging will restore the channel to authorized depths, providing a direct benefit to navigation.	Eventual siltation of channels, making them unusable by larger ships.
Utilities	No Effect	No Effect
Cultural Resources	No Effect	No Effect
Hazardous, Toxic, and Radioactive Substances	No Effect	No Effect
Noise	Minor, temporary increase in noise due to operation of dredge related machinery. No measurable long-term effect.	No Effect

Table ES-2 Compliance with Federal Environmental Statutes and Executive Orders	
Acts	Compliance
Anadromous Fish Conservation Act	FULL
Clean Air Act, as amended (Public Law 88-206)	FULL
Clean Water Act, as amended (Public Law 95-217)	FULL
Coastal Barrier Resources Act	FULL
Coastal Zone Management Act	FULL
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986	FULL
Endangered Species Act of 1973, as amended (Public Law 93-205)	FULL
Estuary Protection Act	FULL
Federal Water Project Recreation Act	N/A
Fish and Wildlife Coordination Act, as amended (16 United States Code [U.S.C.] 661, et seq.)	FULL
Land and Water Conservation Fund Act	N/A
Magnuson-Stevens Act	FULL
Marine Mammal Protection Act	FULL
National Environmental Policy Act of 1969 (Public Law 91-190)	FULL
National Historic Preservation Act of 1966, as amended (Public Law 89-665)	FULL
Noise Control Act of 1972, as amended	FULL
Resource Conservation and Recovery Act (Public Law 94-580)	FULL
Rivers and Harbors Act	FULL
Safe Drinking Water Act, as amended (Public Law 93-523)	N/A
Solid Waste Disposal Act of 1965, as amended	FULL
Toxic Substances Control Act of 1976 (Public Law 94-469)	FULL
Watershed Protection and Flood Prevention Act of 1954 (16 U.S.C. 1101, et seq.)	FULL
Wetlands Conservation Act (Public Law 101-233)	FULL
Wild and Scenic Rivers Act	FULL

Table ES-2, continued Compliance with Federal Environmental Statutes and Executive Orders	
Executive Orders	
Flood Plain Management (Executive Order 11988)	FULL
Protection of Wetlands (Executive Order 11990)	FULL
Federal Compliance with Pollution Standards (Executive Order 12088)	FULL
Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898)	FULL

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ENVIRONMENTAL ASSESSMENT

POTOMAC RIVER FEDERAL NAVIGATION CHANNEL MAINTENANCE DREDGING MARYLAND AND VIRGINIA

1.0 PURPOSE, NEED, AND SCOPE

1.1 Introduction

This assessment addresses two Federal navigation projects on the Potomac River; the *Potomac River below Washington, D.C.,* and the *Potomac River at Alexandria, Virginia* (Figure 1, Appendix C). The Federal channels in this reach covered by this Environmental Assessment (EA) serve the Port of Alexandria, Virginia as well as the Nation's Capital. The channel is authorized to a depth of 24 feet deep, although many reaches have shoaled to 18 feet over the past 25 years (USACE, 1988). Shoaling inhibits use of the channel by larger draft vessels. In order to return the Potomac Channel to its authorized depth, it must be dredged. The segments to be dredged under the current (proposed) action are located in the upstream reaches of this channel near the City of Alexandria, Virginia, and Prince George's and Charles Counties, Maryland. This channel is used extensively by commercial, charter, and recreational watercraft served by numerous docks and marinas located in and around the Potomac River area. The existence and maintenance of the Federal Navigation Channel is of significant benefit to the local and national economy.

1.2 Purpose and Need for Proposed Action

The proposed action is required because the existing Federal Navigation Channel has shoaled and the current depths are unsuitable for the commercial vessels that require access through the channel and into Alexandria harbor and the Nation's Capitol. The Potomac Channel has not been dredged since 1965. Since that time, the channel has shoaled to 18 feet in some areas, which restricts the size of vessels that can utilize the channel.

Assessments made in the late 1980's indicated that the range of drafts of commercial vessels using the channel was 16 to 22 feet. For larger vessels to use the channel to Alexandria, the ships must be light-loaded (i.e. must carry less than their full capacity) so that they don't run aground. The previous economic assessment indicated that as much as 25 percent of the cargo tonnage (per vessel) on both incoming and outgoing vessels was not being utilized due to the controlling depths (USACE, 1988). The potential loss of revenues due to this shipping inefficiency can not be ascertained in 1999 dollars because payload compositions have shifted somewhat since the study was conducted. However, a more recent investigation by Arthur Andersen (cited in several letters in Appendix A) indicated that cruise ship revenues alone would generate $223 million over 9 years for the City of Alexandria and adjacent business centers. During initial scoping for this assessment, the Corps received numerous letters in support of the project, citing the need to restore the channel to the authorized depth to maintain commerce and

maritime heritage in the area (Appendix A). Maintenance dredging will improve navigation within the Potomac River.

1.3 Scope

The Potomac River Federal Navigation Channel was most recently dredged in 1965. Because this dredging occurred prior to the implementation of the National Environmental Policy Act (NEPA), and the National Historic Preservation Act (NHPA), NEPA documentation specific to the proposed project has not been accomplished. This document, therefore, will document the environmental, socioeconomic, and cultural impacts of the periodic maintenance dredging of this channel.

1.4 Public Involvement

A public notice was mailed, via the Baltimore District's automated navigation project mailing list, to more than 200 interested individuals and agencies as part of the NEPA process for the proposed action. Specific agencies include the Maryland Historical Trust, the U.S. Fish and Wildlife Service, the Environmental Protection Agency, the National Marine Fisheries Service, the Maryland Department of Natural Resources, the Maryland Department of the Environment, and other State and Federal agencies of interest. A copy of this public notice (dated 24 July 1998) and responses to the public notice are located in Appendix A.

A public workshop for this project was held on March 15, 1999. This workshop was held in response to comments, focusing primarily on public concern regarding saltwater intrusion into groundwater wells (a concern raised by several individuals in the surrounding area). A list of workshop attendees is located in Appendix A.

The Draft Environmental Assessment (DEA) was released for review in June 1999. It was forwarded to the navigation project mailing list and made available, upon request, to interested parties. The document was also available to the public on the Baltimore District Web page. The public comment period for the DEA ended on July 16, 1999. The comment letters received during the comment period and the Baltimore District's responses to the comments are included in Appendix F.

1.5 Environmental Assessment Review and Approval Process

This EA was prepared in accordance with the Council on Environmental Quality's (CEQ) regulations and Engineering Regulation (ER) 200-2-2 for implementing the National Environmental Policy Act (NEPA).

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 Project Background

The existing Federal Navigation Channel in the Potomac River, known as the *Potomac River below Washington, D.C. Project*, was adopted in 1899, and authorized to a channel of 24 feet deep and 200 feet wide from the mouth of the river to Alexandria, Virginia. Dredging of the Alexandria Waterfront, known as the *Potomac River at Alexandria, Virginia Project*, was authorized in 1910 to a depth of 24 feet deep extending outward to the existing 24-foot contour of the river bottom. The Potomac River channel has 11 segments that are dredged as part of the Federal navigation project. The history of dredging in the channel is included in the U.S. Army Corps of Engineers (USACE), Potomac River Dredged Material Placement Site Study, 1988.

The primary waterborne commerce for the Potomac River navigation project consists of petroleum barge traffic and ocean-going freighter service. Cruise ships also visit Alexandria several times a year (Section 1.2).

Benefits from the proposed dredging are expected from increased vessels trips and/or tonnage to Alexandria and Washington, D.C. Cruise ships have been hesitant to visit the Washington area due to the shallow depths. Based on interest expressed by the cruise ship industry, the city of Alexandria expects a significant increase in cruise ship visits once the authorized depths are restored. Transportation savings are expected from shipping more cargo tonnage per vessel per trip. Presently, larger vessels must light load and await high tides to navigate the Potomac River. The 1997 estimates of waterborne commerce in the United States indicate over three million tons of commerce was transported and almost 20,000 vessel trips were made on the Potomac River. Estimates based upon previous assessments of dredging need indicate that up to 25 percent more tonnage could be shipped through Alexandria if the channels were dredged to the authorized depths (USACE, 1988).

2.2 Current Proposed Action

The proposed action consists of performing maintenance dredging at three locations along the Federal Navigation Channel and placement of the material within a deep area of Gunston Cove. The segments to be dredged are known informally as the Alexandria Waterfront (vicinity of two ship terminals), Hunting Creek Bar, and Mattawoman Bar (Appendix C, Figure 1). A total of approximately 7 miles of channel will be dredged. The authorized channel is 24 feet deep and 200 feet wide in these locations. Material will be removed to a depth of 24 feet Mean Lower Low Water (MLLW) plus a 0.5-foot of allowable overdepth, in each segment. The volume of material to be dredged has been reduced from 970,000 cubic yards (cy) to 564,000 cy of material which will be dredged from the approximately seven miles of channels: 104,000 cy from Alexandria Waterfront, 96,000 cy from Hunting Creek Bar, and 364,000 cy from Mattawoman Bar. The material from Alexandria Waterfront and Mattawoman Bar is primarily fine-grained, cohesive sediment, and the material from Hunting Creek Bar is primarily fine-grained, cohesive sediment with fine sand (Appendix E). The material will be removed by mechanical dredge, and placed in open water within a naturally occurring 35-50 foot-deep area at the Gunston Cove

placement site (Appendix C, Figure 1). The material from Alexandria Waterfront and Mattawoman Bar will be placed first, then covered with the slightly heavier (more sandy) material from Hunting Creek Bar. Placement at Gunston Cove will be a one-time event and will be managed to optimize fish habitat. In initial consultations with National Marine Fisheries Service (NMFS), placement in mounds to optimize topographic changes was suggested as a fisheries habitat enhancement (Appendix A, Letter from NMFS, dated June 18, 1998). Baltimore District has agreed to this placement method and will be instructing the dredging contractor to mound material within the placement site. The dredging method requires the use of a clamshell or similar bucket dredge, which would mechanically dredge material and place it into a barge. This material would then be taken by barge to the open-water placement site and deposited by opening the bottom of the barge.

3.0 ALTERNATIVES TO THE PROPOSED ACTION

Pursuant to the requirements of NEPA Section 102(2)(E), and ER 200-2-2 (March 4, 1988), this EA presents alternatives to the proposed action, including the no-action alternative. Four categories of alternatives were considered along with the proposed action. These categories include (1) the no-action alternative, as prescribed by CEQ; (2) alternative placement location (12 upland sites, 15 beneficial use sites, and 7 open-water sites); (3) an alternative dredging method; and (4) an alternative placement method.

The alternative placement site options were derived from an ongoing site identification process that began in the late 1980's (USACE, 1988). Upland, open-water, and beneficial use sites were identified and evaluated in terms of potential ecological, socioeconomic, and cultural/historical impacts, as well as the feasibility of site development. Upland and landfill options throughout the area were evaluated. The study also examined 10 open-water and nine beneficial use sites. No specific site recommendations were made, but the study weighed the strengths and weaknesses of each site. Due to the limited land resources near the Nation's Capitol and the limited capacity of and SAV presence at many of the beneficial use sites, the open-water placement options were deemed to be among the most feasible for channel maintenance needs.

All potentially feasible options were considered as alternative placement sites for the proposed action and evaluated as part of the DEA. In the 10 years since the placement site identification process began, new information has been obtained for several of the sites. All information gathered for the alternative placement site options is detailed in Sections 3.1.2 and 3.2.2.

3.1 Alternatives Considered

3.1.1 The No-Action Alternative

Inclusion of the no-action alternative is prescribed by CEQ regulations as the benchmark against which Federal actions are to be evaluated. The no-action alternative is generally either a "no change" or "do nothing" alternative to the proposed action. In this case, the no- action alternative involves not dredging the Potomac River channel. Selecting the no-action alternative is equivalent to allowing the existing baseline environmental conditions as identified (in Section 4 of this document) to remain.

3.1.2 Alternative Placement Location

The project purpose could be accomplished by placing of the dredged material at an alternative placement site. The Corps conducted a study in 1988 that analyzed alternatives for placement of materials from the Potomac River channels. Several possible placement sites were analyzed, including both upland and beneficial use placements. There are also alternatives, while not analyzed at that time, which have since been considered.

3.1.2.1 Upland Placement

Potential upland placement at a Maryland or Virginia landfill is an alternative for dredged material. The 1988 study states that "[t]raditional upland placement opportunities are limited in the study area [the Potomac river and surrounding area, from Giesboro Point to its mouth] due to high intensity development along the river, particularly with close proximity to Washington, D.C. Upland opportunities are further constrained by the shoreline topography which is characterized by steep slopes, particularly along the Virginia shoreline." The topography is a problem because there is very little level land on which to place material and it is more difficult to pump dredged material slurry up a steep slope.

Three upland sites were analyzed during the 1988 study, but only one is located within the current study area (from the lower reach of the Mattawoman Bar segment to the upper reaches of the Alexandria Waterfront segment). This site is at Piscataway Park in Maryland. This alternative placement site would serve as agricultural enhancement. This site is shown on Figure 2, Appendix C. Approximately 64,000 cy of material could be placed on the available 10 acres of this site; this is far less than the proposed dredging amount. Two other potential upland placement sites were identified during the 1988 study. These sites include Shackley Point and Cedar Point Neck. The three upland sites could possibly be used together with other small upland sites to create the 564,000 cy capacity required for the placement of the dredged material from the project. This alternative is discussed in Section 3.2.2.1.

Additional potential upland placement sites include one of two available Maryland landfills, Springfield Farms, Mason Neck National Wildlife Refuge, Prince William Forest Park, Lorton (Fairfax County) Landfill, and the Prince William County Landfill. These sites are shown on Figure 3 in Appendix C, and discussed in Sections 3.2.2.2, 3.2.2.3, 3.2.2.4, and 3.2.2.5.

3.1.2.2 Beneficial Use Placement

The 1988 study stated that "[t]here exist opportunities for use of dredged material in beneficial ways, primarily for wetlands and island creation. Protected and low energy embayments of tidal tributaries along the main stem offer ideal conditions for marshland habitat development which could enhance existing resources," provided the sediment characteristics are suitable for such use.

Nine beneficial use sites were analyzed during the 1988 study. These sites include Oxon Cove, Piscataway Creek (Mockley Point), Mattawoman Creek (Marsh Island and Thoroughfare Island), Mattawoman Creek (Cornwallis Neck), Mallows Bay, Potomac River (Chopawamsic Island), Hunting Creek (Mount Vernon), Hunting Creek (Alexandria), and Goose Island. Each of these uses is either a wetland creation or island enlargement project. These sites are shown as numbered white stars on Figure 2 in Appendix C, and are discussed in Section 3.2.2.7.

Additional sites considered included Dyke Marsh, Reagan National Airport, Springfield Farms, Mason Neck National Wildlife Refuge, and Kingman Lake. These sites are shown on Figure 3 in Appendix C.

3.1.2.3 Open-water Placement

The 1988 study suggested use of deep holes in the Potomac main stem as likely candidates for dredged material placement, citing their depth as an advantage. Care would be required to identify an appropriate open-water placement site and ensure that the material to be placed is physically and chemically suitable for such placement.

Seven open-water placement sites, including the Gunston Cove site, were analyzed during the 1988 study. These include Marshall Hall Bar (the Gunston Cove site), Mattawoman Bar, Sandy Point Bar, Liverpool Point Bar, Lower Smith Point Bar, Maryland Point Bar, and three sites at Port Tobacco River. These sites are shown on Figure 2 in Appendix C.

3.1.3 Alternative Dredging Method

The project purpose could also be accomplished using an alternative dredging method. Hydraulic dredging could be used to dredge the channels. This method involves using a hydraulic dredge, which "vacuums" up the sediment and water, and pumps the resulting slurry (approximately 80 percent water, 20 percent solids) through a pipeline to the placement site.

3.1.4 Alternative Placement Method

The dredged material could also be placed at the site using a hydraulic method, even if the material is dredged by a mechanical dredge.

3.2 Alternatives Not To Be Considered In Detail

3.2.1 The No Action Alternative

This alternative will be analyzed briefly in Section 5. However, this alternative would not provide the required depth for continued, unhindered use of the Potomac River channel and Alexandria waterfront. Continued shoaling in the channel would lead to severe restrictions on the sizes and types of vessels able to use this area, and would have a direct negative impact on the local economy.

3.2.2 Alternative Placement Sites

3.2.2.1 Previously Identified Upland Placement Sites

The use of several small upland placement sites, as described in Section 3.1.2.1, is impracticable because of the significant extra cost. If the one site previously identified in the project area, Piscataway Park in Maryland, has a capacity of 64,000 cy, then an additional 500,000 cy of capacity would have to be found for this project. Additional upland sites would have to be reachable by the placement barge, which has a draft of roughly 20 feet, or by a hydraulic pipe, and would have to be available for use during the dredging period proposed. Each upland site would also require wildlife habitat removal and construction of dredged material containment dikes. Such an alternative is impracticable because individual sites may be too small for efficient settling of material. Also, additional costs could be incurred by establishing multiple areas and/or by requiring increased travel/pumping distances.

3.2.2.2 Placement at a Maryland Landfill

During the previous 9 years (1990 to 1999) of scoping for this project, the Corps has contacted two landfills on the Maryland side of the Potomac, in Prince George's County. These private landfills have indicated that they are open for operations 12 hours per day. The proposed action will be a 24-hour activity in order to minimize equipment downtime and ensure that the action will be completed within the proposed environmental window (October 1 through February 15). In addition, double handling is typically needed for landfill disposal. Holding material from a 24-hour dredging operation for placement in a landfill would result in a greater likelihood of double or triple handling. Typically, any extra handling could result in additional costs. That is, the material would have to be taken by barge to a landing, removed from the barge, loaded into trucks, and taken to the landfill for dumping. The landfill would then charge a "tipping fee" on each load dumped at the landfill. An economic analysis of this method indicates that the material from the Alexandria Waterfront segment alone would cost approximately $2.1 million for handling the currently proposed volume (104,000 cy), as opposed to the approximately $1 million placement at the proposed Gunston Cove site. For these reasons, this alternative will not be considered further.

3.2.2.3 Placement at Springfield Farms, Prince William Forest Park, or Piscataway Park

The material to be dredged during the current proposed action would require a placement site approximately 120 acres in size. This placement site would include 8 to 10-foot high dikes (depending on the unique geotechnical qualities of the site's existing soils), and would be filled to 2 feet below the top of the dike by the dredged material. While Springfield Farms is located along the river, and is therefore relatively accessible, this area is preserved as forested lands. Prince William Forest Park, is also protected forestland. Therefore, neither of these two sites would accommodate 120 acres for dredged material placement without significant logging to clear the required acreage for containment. This logging would harm both the aesthetics of these sites and their wildlife and recreational value. Coordination with Piscataway Park over the 9 years of scoping for this project indicates only 10 acres of land available for material placement at this site, which would hold approximately 64,000 cy. This site also has archeological resources that would be adversely affected. The placement of material at any of these sites would also require the double handling described in section 3.2.2.1, and thus would incur significant placement costs. For these reasons, these sites will not be considered further.

3.2.2.4 Placement at Mason Neck National Wildlife Refuge

Mason Neck National Wildlife Refuge is located along Mason Neck, which runs along the Potomac and is relatively easy to access from the Potomac River side. This area is preserved and protected as a forested wildlife refuge. As stated in section 3.2.2.3 above, upland placement of the dredged material would require approximately 120 acres of cleared land. Clearing the trees from this site would have a potentially adverse impact on the aesthetics and wildlife value of this site. Therefore, upland placement at Mason Neck will not be considered further.

There is also the possibility of creating a wetland or mudflat area near Mason Neck, at the mouth of Kanes Creek in Belmont Bay. This wetland or mudflat area would offer additional wildlife benefits for the refuge. However, two factors make this alternative impracticable at this time.

First, the negotiations for this potential project are still underway between the U.S. Fish and Wildlife Service, the Corps, and the refuge. Second, the controlling depths in Belmont Bay are between 2 and 4 feet. Therefore, there would be no way to bring a barge loaded with dredged material into this bay for placement. The material would have to be barged to the Potomac River side of Mason Neck, and pumped (using water added from the Potomac) across the neck (approximately 2 miles) to the placement site, which would incur substantial additional cost. While this alternative may hold promise for potential beneficial use as future habitat creation, the scope of effort and cost to use this site make this alternative impracticable at this time. Therefore, this alternative will not be considered further at this time.

3.2.2.5 Placement at the Lorton (Fairfax County) Landfill or Prince William County Landfill

The Lorton Landfill is not accepting any more dredged material, and is not expected to reopen for dredged material placement. For this reason, the Lorton Landfill site will not be considered further. The Prince William County Landfill is a large facility that was previously used for dredged material from Neabsco Creek. The advantage of this site is its size (approximately 700 acres) and its ability to handle dredged material dewatering and permanent placement. However, the landfill is located approximately 7 miles inland, and would require double handling of the dredged material, as described in section 3.2.2.2 above. The costs associated with placing material at this location are approximately 20 times higher than placement at the proposed Gunston Cove site. For this reason, this alternative will not be considered further at this time.

3.2.2.6 Open-Water Placement at Mattawoman Bar, Sandy Point Bar, Liverpool Point Bar, Lower Smith Point Bar, Maryland Point Bar, Nanjemoy Bar, or Port Tobacco River.

Each of these sites is located downstream of the Mattawoman Creek dredging site, while the Gunston Cove site is located between the Mattawoman Creek site and the Hunting Creek dredging site. These open-water placement sites are located further from the dredging areas than is the proposed Gunston Cove site, as seen below.

Site Name:	Distance Downstream of Mattawoman Dredging Site:	Capacity (cy):
Mattawoman Bar	2 miles	10,500,000
Sandy Point Bar	6 miles	13,100,000
Liverpool Point Bar	10 miles	217,000
Lower Smith Point Bar	14 miles	10,100,000
Maryland Point Bar	19 miles	13,300,000
Nanjemoy Bar	28 miles	16,600,000
Port Tobacco River	32 miles	8,530,000

The placement of material in open water at any of these alternate previously identified sites would involve the same resource issues as those identified for Gunston Cove. Use of other open-water sites, therefore, would not result in additional benefit to the environment, because the potential effects would be very similar. Because of the longer barging route, the proposed project would also incur substantial additional cost as opposed to placement at the proposed

Gunston Cove location. For these reasons, use of these placement sites will not be considered further at this time.

3.2.2.7 Beneficial Use Placement at Oxon Cove, Piscataway Creek (Mockley Point), Mattawoman Creek (Marsh Island and Thoroughfare Island), Mattawoman Creek (Cornwallis Neck), Mallows Bay, Chopawamsic Island, Hunting Creek (Mount Vernon), Hunting Creek (Alexandria), and Goose Island.

In the intervening years between the 1988 report and the current proposed project, the prevailing practices in beneficial use and habitat creation have evolved. The placement sites identified in the 1988 report as suitable locations for wetland creation and island enlargement have been re-evaluated and found unsuitable. The primary reason for their unsuitability is that each of these areas either currently or historically has supported submerged aquatic vegetation (SAV), which is now known to be vital to the health of the watershed and its animal inhabitants. Additionally, depths suitable for SAV (less than 6 feet) are valuable shallow open-water habitat and of ecological significance to the Chesapeake Bay watershed.

Site Name	**Species**
Oxon Cove	*M. spicatum, H. verticillata; V. americana*
Piscataway Creek (Mockley Point)	*H. verticillata; H. dubia*
Mattawoman Creek (Marsh Island and Thoroughfare Island)	*H. verticillata*
Mattawoman Creek (Cornwallis Neck)	*M. spicatum, H. verticillata; V. americana; H. dubia; C. demersum*
Mallows Bay	*M. spicatum, H. verticillata; V. americana; H. dubia; C. demersum*
Chopawamsic Island	*H. verticillata*
Hunting Creek (Mount Vernon)	*H. verticillata*
Hunting Creek (Alexandria)	*M. spicatum; H. verticillata*
Goose Island	*M. spicatum, H. verticillata; C. demersum*

SOURCES: http://www.vims.edu/bio/sav/sav98/quads/al034.html and Virginia Institute of Marine Science (1994). *1993 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay.*

Placement of material on existing SAV beds to create wetlands or islands is seen as destructive and therefore highly undesirable. For these reasons, these placement sites will not be considered further.

3.2.2.8 Placement at Dyke Marsh

Coordination over the last 9 years with the National Park Service (NPS), who owns and operates Dyke Marsh, indicates that they are not interested in dredged material placement at this time. Their reasons for this are twofold. First, there are SAV beds along the waterside edges of the marsh, which would be covered and destroyed by the material placement. Second, the proposed placement would not include geotextile tubes or other containment structures, because the NPS has stated that it is opposed to this type of containment at this site for aesthetic reasons.

However, it is believed that unconfined sediments at this location, which has exhibited large-scale erosion over the last decade, would quickly erode and increase the turbidity of the water downstream from the site. For these reasons, this alternative will not be considered further at this time.

3.2.2.9 Placement at Reagan National Airport

Air safety regulations prohibit placement of a wildlife attractant, such as a created wetland with dredged material placement, near the airport. No upland placement opportunities exist at this site. For these reasons, this site will not be considered further.

3.2.2.10 Placement at Kingman Lake

The sediments from the Potomac River may be suitable for beneficial use in wetland creation at Kingman Lake. Kingman Lake is a tidal basin located approximately 9 miles north-northeast from the Alexandria Waterfront dredging location, along the west bank of the Anacostia River near Robert F. Kennedy Stadium. The Corps is planning to perform restoration activities at this site, including the proposed placement of dredged materials in the lake to restore its shallow depths and, thereby, its wetland habitat. Approximately 131,000 cy of dredged material is required for this project. Part of the 104,000 cy of material dredged from the Alexandria Waterfront site could potentially be used for this project. The Kingman Lake placement site is unusable, however, due to an existing agreement between the Corps and the NPS that only sediments from the Anacostia River will be used for Kingman Lake habitat creation. For this reason, this alternative will not be considered further at this time.

3.2.3 Alternative Dredging Method

Mechanical dredging is significantly more economical than hydraulic dredging for this particular project, given the distance between the dredging and placement sites. The use of a hydraulic dredge instead of the proposed mechanical dredge would provide no additional environmental or economic benefit. For these reasons, hydraulic dredging will not be considered further.

3.2.4 Alternative Placement Method

Hydraulic dredged material placement could be used at the proposed placement site in place of the open barge method proposed. Hydraulic placement would entail mixing the dredged material from a barge with river water to form a slurry. This slurry would be pumped hydraulically through a pipe extending through the water column, and placed approximately 6 feet from above the existing bottom sediments at the placement site. This method allows greater control of the placement activities, preventing the mounding that sometimes occurs with open barge placement. However, mixing the fine sediment with water reduces material cohesion and strength, thus making it more susceptible to entrainment and transport while settling occurs. Based on the Corps' engineering analysis of the sediment strength and composition, the currents of the river, and depth of the placement site, the proposed project will place material to the river bottom within several seconds in a cohesive manner. As a result, the reduced time of exposure through the water column minimizes degradation to the material's cohesive properties, compared to the longer settling time of material slurry placement. The additional turbidity caused by the hydraulic method due to the material's in-cohesive properties may last for some time.

Additionally, mounding of placement material on the riverbed is a desirable feature for the establishment and enhancement of fish habitat. For this reason, this alternative will not be considered further at this time.

3.3 Alternatives Conclusions

The alternatives analysis yielded several pertinent conclusions relative to the proposed action:

- The no-action alternative would result in fewer environmental trade-offs but would not fulfill the maintenance dredging needs in the Potomac River.
- In terms of placement alternatives, the only alternative found to be ecologically and economically practicable at this time was the deep area of Gunston Cove. No landfill sites were found to be suitable, due to the prohibitive cost of double-handling the material and paying tipping fees. Other upland sites were not available because of size, cost, owner/operator disinterest and/or accessibility. Beneficial use sites were impracticable at this time because of SAV concerns, previously existing interagency agreements, or aviation safety regulations. The other open-water placement sites were eliminated from consideration for the proposed project, because they are each farther away from the dredging site than the proposed placement site, and would therefore incur higher transportation costs without any reduction in environmental tradeoffs.
- Hydraulic dredging would not provide any environmental or economic benefit to the project and was, therefore, rejected.
- Hydraulic placement of mechanically dredged materials would be more costly and could potentially cause greater turbidity.

Although some of the alternatives examined were technically feasible, all feasible action alternatives involved greater costs, greater potential for ecological perturbations, or both. Because the project users are experiencing increased problems using the navigation channel and a need to restore the navigation channel to the authorized depth has been demonstrated, the no-action alternative has been rejected.

4.0 AFFECTED ENVIRONMENT

The proposed action includes three dredging areas over an 18-mile reach of the Potomac River (from Alexandria, Virginia to Indian Head, Maryland) with a proposed placement site that lies within the reach. For purposes of this investigation, this 18-mile stretch of the Potomac generally constitutes the "study area." The "project area" is limited to the channel areas being dredged and the placement site, as described previously. In some cases, a larger area is necessary to evaluate regional resources or a smaller area to describe dredging- or placement-site-specific conditions.

4.1 Land Use

4.1.1 General Land Use

The Washington area is a highly developed region, consisting primarily of residential and commercial land uses, with some industrial areas upstream of the project area. Approximately 4,563,123 (1996 Census Bureau Estimate) people live in the greater Washington, D.C. area. The proposed placement site is a deep area off Fort Belvoir, Virginia, between Dogue Creek and Gunston Creek. This area has no designated land use category because it is riverine. The dredging area itself is within the Potomac River, which also has no designated land use category.

4.1.2 Aesthetics and Recreation

The portions of the river to be dredged are considered aesthetically pleasing portions of the lower Potomac River. The river is wide and deep, and is visually buffered on both sides by trees for most of its length south of Alexandria. The George Washington Memorial Parkway runs along the western shore of the Potomac from Alexandria to Mount Vernon, creating a recreational area for hiking, jogging, bicycling, and picnicking. Several other riverside parks also occur on both sides of the river, including Mason Neck National Wildlife Refuge, Leesylvania State Park, Mattawoman National Estuarine Area, Piscataway Park, Fort Washington, and Fort Foote. However, the waters of the Potomac are occasionally limited for use by anglers and swimmers because of degraded water quality.

4.2 Air Quality

The Lower Potomac River is located in the National Capital Interstate Air Quality Control Region, which has been designated by the U.S. Environmental Protection Agency as non-attainment for nitrous oxides NO_x (moderate), O_3 (serious), and CO (moderate) (U.S. Environmental Protection Agency, 1992). The "moderate" and "serious" designations indicate what process a new permanent source has to go through for approval. There will be no new permanent sources of air emissions created as part of the proposed action.

The climate of the Potomac watershed is temperate and humid. Winter and summer temperatures are moderated to an extent by the proximity of the Chesapeake Bay. The average annual temperature is 55 degrees Fahrenheit (F), with maximum temperatures of 107 degrees and minimum temperatures of -26 degrees F. Average monthly temperatures do not fall below

freezing; the coldest month on record averages 35 degrees F and July, the warmest month, averages 80 degrees F.

4.3 Water Quality

4.3.1 Surface Water

The Potomac River drains more than 11,500 square miles of the mid-Atlantic coastal region. The river can be divided into four regions: free-flowing zone, tidal freshwater zone, transition zone, and saline zone. The Potomac River is free flowing for approximately 300 miles, from its West Virginia headwaters in the Appalachian Mountains to the fall line at Chain Bridge, near Little Falls in Washington, D.C. From this point to the Chesapeake Bay, the river is influenced to varying degrees by tidal currents. The freshwater tidal zone extends approximately 40 miles from the Chain Bridge in Washington, D.C., to Quantico, Virginia. This region is strongly influenced by the flow of the upper Potomac, but in the downstream reaches of this region, deeper areas are subject to inflows of heavier saline water from the Chesapeake Bay. The transition zone extends from Quantico to Morgantown. In this zone, the fresh water of the upper Potomac mixes with the saline water of the lower Potomac. Salinity may range from zero to seven parts per thousand (ppt). South of the Route 301 bridge to the Chesapeake Bay is the most saline portion of the Potomac River, with average salinity ranging between 7 and 11 ppt. The average tidal range in the Potomac River in the project area is 3 feet. Annual precipitation ranges from 42 to 44 inches, with 2 to 4 inches per month in the winter and 4 inches per month during the spring and summer. During the summer months, precipitation occurs mainly as thunderstorms, sometimes resulting in heavy precipitation. Average annual snowfall in the Potomac watershed is about 20 inches, with the heaviest precipitation occurring in December, January, and February.

The Potomac River is the only major fresh surface-water source within the Washington Metropolitan area. A combination of direct surface runoff and subsurface discharge from groundwater storage provides stream flow. During periods between storms and during low-flow periods, a greater percentage of the water source is received from supplemental upstream reservoir storage and from groundwater flow. Peak flows usually occur between February and May due to the spring thaw of mountain snow and due to increased seasonal rainfall. Minimum flows tend to occur during the warmer months of June through October.

There are 20 water quality testing stations in the Lower Potomac River hydrologic unit, downstream of the Alexandria Waterfront segment, which contains almost all of the current project area. The data from these stations, as interpreted by the U.S. EPA, indicates that the Lower Potomac hydrographic unit has an Index of Watershed Indicators (IWI) score of 2, indicating that the water quality is better than most, but this quality is highly vulnerable to such stressors, such as pollutant loadings (stormwater runoff, fertilizers, polluted discharges). The Middle Potomac hydrographic unit, which is directly upstream of the Alexandria Waterfront dredging area, has an IWI score of 4, indicating that the water has some less serious problems than most, but is highly vulnerable to stressors.

George Mason University researchers monitor water quality and a variety of biological resources in the vicinity of the proposed placement site (Jones and Kelso 1988, 1998). Most monitoring is conducted within Gunston Cove, although a station adjacent to the proposed placement site is also monitored. Generally, water quality at the mainstem station reflects slightly lower pH and DO levels than the shallow cove stations. Most nutrient levels are comparable or slightly lower than levels found within the cove, although ammonia is considerably lower in the mainstem Potomac during most months (Jones and Kelso, 1998).

A Corps investigation of fish occurrence in deep water habitats in the Potomac (Kasul et. al, 1990) indicated that the dissolved oxygen level at the deepest area of the proposed placement site was 11.1 milligrams per liter (mg/l) at both the surface and the bottom, suggesting that surface and bottom waters were well mixed with no vertical stratification. Water velocity taken along 5 transects within the placement area at the time of these measurements was approximately 1.0 ft/sec at the surface, and there was no detectable current in the mid-column or near the bottom.

4.3.2 Groundwater

The predominant groundwater resources within the study area are derived from the Potomac Group aquifer system that underlies some reaches of the lower Potomac River. Rural residences on both banks of the Potomac River as well as several municipalities along the lower Potomac are reliant upon this resource for water supply. Concerns were raised that past and future Mattawoman Channel maintenance dredging could pose a threat to groundwater supplies or groundwater quality in the region (Appendix A). There has been considerable scientific investigation into the subject. The Maryland Geological Survey (MGS) has conducted two groundwater modeling investigations. The U.S. Geological Survey (USGS) has also conducted two investigations. In addition to these studies, the Corps has performed geologic coring of the Mattawoman Channel bottom to supplement these reports and address certain concerns (Appendix D).

The Mattawoman Bar portion of the channel lies adjacent to the Naval Ordnance Station (NOS) and the town of Indian Head. This is an area of high-volume groundwater pumpage that dates back to the late 1800's. It is also an area that has experienced some saltwater intrusion in wells located closest to the river (Andreasen and Mack, 1998). While pumping rates have decreased slightly in recent years at NOS, housing development in Charles County (and subsequent water demand) has increased public concerns about a sustainable fresh water supply.

Though there have been saltwater intrusion effects measured in some of the wells, the USGS attributes this primarily to over-pumping of the aquifer (Hiorthdahl, 1997). Large-scale groundwater pumping began about 1900. This was also the beginning of the decline in water levels in the Potomac Group aquifer. By the 1930's, the "cone of depression" (which refers to the water table surface around a pumping well) had been lowered to depths of up to 100 feet below sea level. Through time, this water-table depression has grown larger and has altered the natural flow of groundwater (Hiorthdahl, 1997). In a natural system, rainwater percolates downward to the water table. Now called groundwater, it flows from the upland areas toward the river, and eventually discharges into the river. When pumping creates a groundwater depression

next to a river, groundwater flow directions reverse, and water flows from the river into the pumping wells. In other words, it appears that, during much of this century, water from the Potomac River has provided recharge to the aquifer in the Indian Head area.

The flow velocity of this river water through the clays, sands, and gravels of the Potomac Group, however, is quite slow (Andreasen and Mack, 1998). Groundwater from selected wells across the length of the Indian Head peninsula was age dated using tritium and organic carbon. Results of this testing show that the water from these wells entered the groundwater flow system before 1952 (the first date that tritium entered the atmosphere from above-ground bomb testing) (Fleck and Wilson, 1990). The organic carbon data also support this date. This holds true even for the wells located within a few hundred feet of the river. It is easy to mistakenly correlate the saltwater intrusion (which was first noticed in the 70's) with the last dredging of the Mattawoman Channel (1965). The age testing discussed above conclusively disproves this correlation.

The USGS suggested that enhanced contact between the river and the aquifer could increase salt water intrusion (Fleck and Wilson, 1990). This occurs when clay deposits on the bottom of the river are removed, exposing river water directly to porous aquifer material. This happens naturally during flood events, especially in the deep erosional channels (or thalwegs) of the present river. It can also happen due to dredging.

Preliminary borings installed for chemical analysis of the channel sediments indicated that there was a layer of clay material protecting the aquifer at Mattawoman. Though the clay was proven to extend deeper than the depths of the proposed dredging, the precise thickness of this clay was not determined. Since the thickness of this clay layer was a concern, the Corps drilled three new borings. One is located near each end of the channel, and one is drilled in the middle. These borings show that there is a minimum of 26 feet of clay in the bottom of the Mattawoman channel (north end). This clay layer increases to a thickness of 52 feet on the south end of the channel. Because the maintenance dredging will only remove a maximum of 4 to 5 feet of this clay material, a layer of clay (greater than 20 feet) will remain after dredging is complete. This layer is sufficiently thick to protect the aquifer from intrusion in that area.

4.4 Vegetation

4.4.1 Terrestrial Vegetation

There is no terrestrial vegetation within the Potomac River channel, and the placement site is a deep riverine hole. Therefore, there are no terrestrial vegetative habitats in the project area.

4.4.2 Submerged Aquatic Vegetation (SAV)

Aerial surveys of submerged aquatic vegetation (SAV) in 1998 indicate that no SAV beds are located within the segments proposed for dredging, or within the deep area proposed for material placement. However, stable SAV beds, as shown in Figure 4 in Appendix C, are located within 500 yards of the lower portion of the Alexandria Waterfront segment. These beds are inhabited by Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), and coontail

(*Ceratophyllum demersum*). Other SAV in the study area is shown on Figures 5 through 8 in Appendix C.

4.4.3 Wetlands

No wetland areas occur within the Federal Navigation Channel or the proposed placement site, because they are deepwater habitats (20-50 feet deep, respectively) incapable of supporting wetland vegetation or performing wetland functions. These areas are also located far enough offshore that they are not adjacent to any wetland areas. Therefore, there are no wetlands in the project area.

4.5 Wildlife Resources

The dredging and placement operations will take place entirely in open water. There are no terrestrial wildlife habitats in these areas. The open water may be used occasionally by large waterfowl (ducks, geese), raptors (hawks, eagles), or shorebirds (terns, gulls) for resting or feeding. Wading birds (herons, egrets) would use the adjacent shallows for foraging habitat. Many bird species, including Bald Eagles, are known to nest along the banks of the entire Potomac River. The open waters of the study area are not used as overwintering habitat. The more protected areas of Gunston Cove are utilized by waterfowl species in winter (Jones and Kelso 1998).

4.6 Aquatic Resources

4.6.1 Fisheries

The Potomac River supports a diverse fishery including both recreationally and commercially important species. The Potomac serves as a spawning and nursery area for many fish species of regional significance including striped bass, white perch, smallmouth bass, largemouth bass, alewife, blueback herring, and American shad (CBP 1991).

During the initial coordination for this assessment, several respondents expressed concerns that the proposed dredging and placement areas were within significant nursery areas of the River and that the proposed placement site may constitute a significant overwintering area for fish. The Corps conducted winter fisheries surveys in February 1990 at four deep-water sites in the Potomac River to determine wintertime use of these areas by fish. The areas sampled were in a reach extending from 5.5 to 14.5 miles below Alexandria, Virginia, and included the proposed placement site for the material dredged as part of the current action. They included three deep holes located near the mouth of Piscataway Creek, (1) below Dogue Creek, (2) below Pomonkey Creek, and (3) a main channel site downstream from Gunston Cove. The study compared physical and chemical differences between sediments at the current proposed placement site and a nearby reach of the main channel below Gunston Cove. Fish collected during this survey include gizzard shad, golden shiner, spottail shiner, brown bullhead, channel catfish, striped bass, white perch, largemouth bass, tessellated darter, and yellow perch. The 1990 study results indicated no data to suggest that deep holes are a more valuable overwintering habitat for fish than shallow main-channel areas of the Potomac River.

The Corps has also been coordinating with the U.S. Fish and Wildlife Service (USFWS) regarding the extent of shortnose sturgeon (SNS) inhabitation of the Upper Chesapeake Bay and the Potomac River. As part of this coordination, the Corps has funded the USFWS to undertake a SNS survey in the Potomac River. To date, the USFWS has completed two seasons of sampling at five Potomac River sites: three sites near the Route 301 bridge, and two sites near Mason Neck. The USFWS is currently continuing its third season of sampling. Although no sturgeon have been caught thus far, the USFWS has caught the following species:

striped bass*	croaker	longnose gar
channel catfish*	blue catfish*	white catfish
blue crab	gizzard shad*	white sucker*
spot	weakfish	menhaden*
hogchoker	cownose ray	white perch
flounder	yellow perch*	harvest fish
carp*	crayfish*	

* Indicates species found at the Gunston Cove (Site 1) proposed placement site.

Researchers from George Mason University have been monitoring the fish community adjacent to the proposed placement area and have found a similar number of species near Gunston Cove. (Jones and Kelso 1998). Other species found near the proposed placement site include American eel, goldfish, spottail shiner, white catfish, brown bullhead, pumpkinseed, tessellated darter and yellow perch.

Coordination with USFWS undertaken by the Corps for another project, the dredging of the Washington Sailing Marina (WSM) near Ronald Reagan National Airport (approximately 1.5 miles above Alexandria), indicated that the WSM project area in the Potomac River is a spawning and nursery ground for five species of anadromous fish, including American shad, alewife, blueback herring, white perch, killifish, shiners and yellow perch. It is likely that Four Mile Run, which runs into the WSM, is a spawning attractant for alosids (shad and herring). Alewife and blueback herring are known to spawn in the small streams on Fort, Belvoir and to utilize the protected areas of Gunston Cove as nursery areas (Jones and Kelso, 1998). Alosids are species of great concern to the Chesapeake Bay community, and millions of dollars have been spent to restore the American shad and to remove river blockages that restrict anadromous fish spawning. This area is also an important foraging ground for juvenile and adult striped bass. This shallow water habitat can be compared to the shallow areas adjacent to and including the areas that are currently proposed for dredging. Similar spawning and nursery areas may be found along the existing Potomac River Navigation Channel route and near the proposed Gunston Cove placement site.

4.6.2 Benthic Community

The benthic community within the Potomac provides essential fish forage. Sampling of a deep area near Gunston Cove was conducted by the Baltimore District from August 31 and October 29, 1992. (The navigation channels would be expected to have a similar benthic community as those found in the deep areas of the placement site). The most common benthic species found at

this site are listed below. The Gunston Cove sampling yielded 33 different taxa compared to samples taken at Fort Washington which yielded 39 different taxa. Fort Washington also had a higher abundance of benthic organisms than Gunston Cove. The sample depths ranged from 10-16 meters. Dissolved oxygen ranged between 6.5 to 10.2 (mg/l). The most common benthic organisms are given below in order of greatest abundance. The navigation channels would be expected to have a similar benthic community as those found in the deep areas of the placement site. Since this sampling began in the late summer, it may not reflect the effect of hypoxia or anoxia on the benthic community. These conditions are more prevalent earlier in the summer when flows are low.

Class	**Order**	**Family**	**Genus**
malcostraca	*amphipoda*	*gammeridae*	*gammarus*
annelida	*oligochaeta*	*tubificidae*	*limnodrilus*
malcostraca	*isopoda*		*cyathura*
gastropoda	*mesogastropoda*	*hydrobiidae*	*amnicola*
mollusca	*pelycopoda*	*corbiculidae*	*corbicula*

George Mason University researchers recently sampled a station adjacent to the proposed placement site which yielded predominantly oligochaetes and chironomids (Jones and Kelso, 1998). As part of the SNS study discussed above, the USFWS has located two beds of Asiatic clam and collected two crayfish at the proposed placement site, neither of which are considered commercially valuable. Commercially valuable benthic species are discussed in the following section.

4.6.3 Commercially Valuable Species

No commercially valuable bivalve (clam/oyster) species are found within the study area. Other commercially important species are detailed below.

4.6.3.1 Blue Crab

Blue crabs utilize the entire water column in all habitats in the Chesapeake Bay, from the deepest waters to the water's edge, and from the most saline to most fresh water. Blue crabs are most abundant in deeper portions of the Bay during winter, but prefer shallower waters during summer. The current study area is uninhabited by blue crabs during the winter months, but is a low-density range for male and female crabs during the summer. Blue crabs do not spawn in the Potomac River (CBP 1991).

4.6.3.2 Striped Bass

The principal spawning and nursery area for striped bass along the Atlantic Coast is the Chesapeake Bay and its tributaries. There are three distinct spawning populations of striped bass in Maryland: the Potomac River, the Choptank River, and the Upper Bay. Within the Potomac River, the major spawning occurs from Maryland Point to Quantico, as shown in Figure 9 in Appendix C, and encompasses Maryland Point Bar. The Mattawoman Bar segment is within the moderate spawning area.

In winter, during the coldest weather, striped bass concentrate in waters greater than 9 meters deep, where temperatures are somewhat warmer than those at the surface. During warmer periods, the overwintering fish often move out of the deep waters in search of food. Striped Bass overwintering in the Maryland waters of the Chesapeake Bay typically are smaller than 22 inches (559 mm) total length, and fish overwintering in the tributaries tend to be smaller than fish overwintering in the mainstem of the bay.

There is increasing concern that low concentrations of dissolved oxygen (DO) in the deeper waters of the upper Chesapeake Bay and its tributaries have eliminated much of the summer habitat of sub-adult and adult striped bass. Optimum water temperature for adult striped bass is 20 to 22°C (68 to 72°F), and adults avoid waters where the temperature is greater than 25°C (77°F) if cooler water is available. Striped bass of all ages avoid water with DO concentrations less than 3-4 mg/l.

4.6.3.3 White Perch

White perch spends its entire life in the Chesapeake Bay and its tidal tributaries. White perch overwinter in the downstream portions of the tributaries and deeper saline waters, usually at depths greater than 6-12 meters in areas with salinities between 10 and 20 ppt.

4.6.3.4 Largemouth Bass

Largemouth bass reside in fresh and low brackish streams with salinities up to 12 ppt. Due to recent improvements in water quality in the Potomac, and the growth of hydrilla (which provides habitat), the largemouth bass has become a much-sought-after sport fish. Numerous bass tournaments are currently held in the Potomac River throughout its length.

4.6.3.5 River Herring and American Shad

River herring (alewife and blueback herring) and American shad once constituted significant commercial fisheries within the Chesapeake Bay. Declining populations have severely reduced harvests to the point where a fishing moratorium has been imposed upon American shad. River herring are still commercially harvested in the region. River herring utilize the freshwater streams and uppermost reaches of the tidal Potomac for spawning. American shad spawn in the uppermost reaches of the mainstem Potomac. All species utilize the study area as nursery habitat.

4.6.4 Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires Federal agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by that agency that may adversely affect EFH under the Act. The first designations of EFH in the Northeastern United States were approved by the secretary of Commerce on March 3, 1999.

Coordination between the Corps and the National Marine Fisheries Service (NMFS) (Goodger, pers. comm., March 26, 1999) indicated that, because of the low salinity in the project area, it would not be considered EFH for bluefish, summer and winter flounder, or other predator species

covered under EFH, because these species are unlikely to venture in the area. NMFS has indicated that this portion of the Potomac River could provide EFH for Alosids (such as alewife, atlantic menhaden, and blueback herring) which, although they are not listed species under the Act, are common forage fish for bluefish and other species. NMFS has indicated that it would likely request seasonal restrictions on dredging activities to protect critical life stages of these forage species.

Alewife spawning usually begins within the bay from early-mid March, and runs through April if temperatures are above 8 °C. Juvenile alewives tend to remain in the tidal freshwater nursery areas in the spring and early summer, but they also may move upstream in summer with the encroachment of saline water. Adult blueback herring move to predominantly fresh or brackish areas of the bay to spawn. Spawning takes place in early April in the lower bay tributaries, and in late April in the upper bay; about 3 to 4 weeks after the peak alewife runs. Atlantic menhaden are generally coastal spawners, though some may spawn at the mouth of the bay. The larvae enter the bay where they remain for a year. Juvenile Menhaden can withstand substantial variations in salinity ranging from 3.5 ppt to ocean salinity (35 ppt), and are often very abundant in the low salinity waters of middle and upper tributaries.

4.7 Threatened and Endangered Species

By letter dated June 4, 1998, NMFS recommended that the Corps initiate consultation with NMFS to evaluate potential impacts of the proposed current project on the SNS. In this letter, NMFS stated that "although there are limited data on Potomac River SNS, the presence of the species in the project area indicates that Sturgeon mortalities or other adverse impacts could result from open-water placement actions" (Appendix A). To address this concern, the Corps has funded the USFWS to undertake a SNS survey in the Potomac River. To date, the USFWS has completed 1 year of sampling at five Potomac River sites: three sites near the Route 301 bridge, and two sites by Mason Neck near the proposed placement site. Although no sturgeon have been caught thus far, the USFWS is continuing its second year of sampling.

Coordination with NMFS in November 1998 as part of another project, the Washington Sailing Marina (WSM) dredging project, indicated concern by that agency that the WSM project could impact SNS if they were to travel up the Potomac River to a potential spawning area at Little Falls. That coordination with NMFS determined that there would be no impacts to sturgeon if dredging activities in the marinas ceases by March 15. It can be assumed that the same ecological window applies to the current proposed action in the Potomac River.

In response to the public notice for the project (pursuant to Section 7 of the Endangered Species Act), USFWS (letter dated August 18, 1998) acknowledged the Corps' role in helping to fund SNS research in the Potomac, and did not raise any other endangered species concerns (Appendix A). More recently, (June 3, 1999), the Corps contacted NMFS to report the results of the first year of study (Appendix A). In response, the NMFS, by way of a letter dated July 8, 1999 (Appendix A), concurred that the project is not likely to affect SNS. An environmental window of October 1 through February 15 will be observed for the proposed action.

During the public response period for the DEA, the Virginia Department of Conservation and Recreation noted the occurrence of bald eagle nests near the proposed placement site (Appendix F). The bald eagle is a federally threatened species. The respondent's concern was for human activity in the vicinity of nesting, feeding, and breeding areas. Although the letter recommends Section 7 consultation with USFWS, the previous USFWS letter did not indicate any issues with bald eagles relative to the proposed action. Virginia Department of Conservation and Recreation indicated no heritage species in the vicinity of the Mattawoman or Alexandria dredge sites (Appendix F).

4.8 Prime and Unique Farmlands

Both the dredging and placement sites are located in open water. No prime or unique farmland soils are present at either site.

4.9 Wild and Scenic Rivers

The Lower Potomac River is not listed as a Federal or State Wild or Scenic River, and no other listed rivers are located at or near the project area.

4.10 Cultural Resources

The Potomac is an American Heritage River, and has significant historical resources along its banks. In addition to the historical resources dating back to colonial America, there are also sites of prehistoric significance. Since the founding of this country, the Potomac has supported, among other things, a proud maritime tradition.

All dredging actions in the Potomac River project area will be conducted in areas that have been dredged in the past. The horizontal and vertical dimensions of the channel will not be changed or reconfigured. As a result, there is no potential for adversely impacting submerged historic properties in the Potomac River channel. Placement of the dredged material at the Gunston Cove site does not have the potential to adversely effect any submerged cultural resources that might be located there.

Section 106 of the National Historic Preservation Act requires formal consultation with the State Historic Preservation Officer (SHPO) prior to any Federal action. In August 1998 (in response to the Public Notice of the Project), the SHPO indicated that the project was unlikely to affect any significant historic and archaeological resources. Baltimore District sent a letter to the SHPO in April 1999 to complete the consultation process (Appendix A). Since no response was received within 30 days, the Section 106 consultation was considered complete.

4.11 Hazardous, Toxic, and Radioactive Substances

The proposed project area is within the existing Federal navigation channel, Alexandria waterfront, and Gunston Cove placement site. A review of the Comprehensive Environmental Response and Liability Information System (CERCLIS), Toxic Release Inventory System (TRIS), and the Resource Conservation and Recovery Information System (RCRIS) databases did not identify sites existing within the proposed project area.

4.12 Sediment Quality

Sediments from the proposed dredging area and placement site have been analyzed for physical characteristics and chemical composition since 1990 (USACE 1998, GES 1999, Chemanalysis 1990). The results have been appended to this document (Appendix E). Physical analyses indicated that the sediments of the Gunston Cove placement site were very similar in composition (percent sand/silt/fines) to the materials in the channels proposed for dredging. The materials were predominantly fine-grained silts and clays. The Hunting Creek sediments contained slightly higher percentages of sand than the other areas.

Chemical analyses indicated that PCBs and other organic contaminants were below detectable levels. Metals were detected at low levels in all sediments. The material is considered acceptable for overboard placement in accordance with Spoil Disposal Criteria for Maryland Water (MD DNR, 1975). The State of Maryland issued a water quality certification for the project based on a review of sediment quality data provided by the Corps. The only constituent found at elevated levels was arsenic (Appendix E). Arsenic occurs at naturally high levels throughout the soils of the Potomac River basin. The USGS indicates that the soils at the headwaters of the Potomac and along the Virginia side of the Potomac near the current study area range from 16 parts per million (ppm) to 20 ppm of arsenic, with soils near the placement area having levels of approximately 6.5 ppm of arsenic (USGS, undated). Sediment samples taken within the proposed dredging areas range from 5.2 mg/kg to 10.1 mg/kg. A composite sediment sample at the proposed Gunston Cove placement area is 9.1 mg/kg. Parts per million are equivalent to mg/kg. Thus, the sediments to be placed in Gunston Cove have arsenic levels comparable to those naturally existing. Detailed sediment analyses are included in Appendix E.

4.13 Infrastructure

The Washington, D.C., metropolitan area is serviced by numerous telephone, electrical, natural gas, water, and cable television providers. Each municipality supports full-time police and fire units. Numerous hospitals, ambulance companies, public and private schools and libraries are located throughout the Washington, D.C., metropolitan area, as are several state, local, and private colleges and universities. All of these activities rely on the numerous communication and utility providers in the area.

The Potomac and Anacostia Rivers are the primary water transportation routes in the project area. Both routes are supported by the Federal Navigation Channel in the Potomac River south of Washington.

Major land transportation routes include I-95, the Capital Beltway (I-95 / I-495), Route 210, Route 1, and the Fairfax County Parkway. The road network in the area is highly developed, especially on the Virginia side of the river, and is critical to the provision of emergency and medical services in the area.

4.14 Socioeconomic Conditions

Approximately 4,563,123 (1996 Census Bureau Estimate) people live in the greater Washington, D.C., area. This is an 8.1 percent increase in population from the 1990 census. The 1990 census

indicated that 101,154 people lived in Charles County in 1989, with a per capita income of $16,555; 729,268 people lived in Prince George's County, with a per capita income of $17,391; and 111,183 people lived in the City of Alexandria, with a per capita income of $25,509. The primary professions within the region are the Federal government, public administration, retail, and construction.

4.15 Environmental Justice

Executive Order 12989, dated February 11, 1994 (Environmental Justice in Minority Populations and Low-income Populations), requires that proponents of Federal projects assess potential impacts of proposed projects on minority or low income populations. The proposed project area includes the Alexandria waterfront, Hunting Creek Bar near Fort Foote, Gunston Cove Placement Site near Fort Belvoir, and Mattawoman Bar off the shore of Indian Head, Maryland. Neither low income or minority communities exist within close proximity to the proposed project area.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Land Use

5.1.1 General Land Use

The proposed action will not result in any change in land use zoning or categorization.

5.1.2 Aesthetics and Recreation

The proposed action will result in no significant long-term changes to aesthetics and recreational opportunities. Returning the Federal Channel to the authorized depths will return commercial vessel traffic to the levels experienced in the area prior to shoaling. Some short-term impacts to this resource are expected. The dredging barge and hauling barge will be consistent, visually, with the boat traffic already existing on the river. However, these vessels will use a certain amount of river space, depending on their size, which will be unavailable to other boats (both commercial and recreational) while they are present. Because the Potomac channel is large enough to accommodate these other boating uses, the disruptions are expected to be minimal. The commercial vessels calling on Alexandria and DC will be consistent, visually, with the current usage of the river. The dredging will occur during the winter, which is the off-season for swimming, boating, and fishing. Therefore, no reduction in recreational swimming, boating, or fishing opportunities are likely to occur as a result of the proposed action.

Some short-term aesthetic impacts may be experienced due to increased turbidity at the dredging or placement sites. Because turbidity is expected to dissipate quickly and because the proposed action will occur when recreation is lowest in the area, the potential impact is not expected to be significant.

5.2 Air Quality

As stated in 40 CFR 93.153(c)(2)(ix): *Maintenance Dredging and Debris Disposal at an Approved Placement Site*, the proposed actions are exempt from the Clean Air Act Conformity Requirements (58 CFR. 3214, 30 Nov. 1993). The project will result in a minor, temporary increase in emissions from the dredging barge, and the barge(s) that will carry the material to the placement site. Emissions produced by the proposed project will not exceed ambient air quality standards and are accounted for in the Maryland State Implementation Plan. For these reasons, the proposed action will have no significant impact on air quality. The Potomac within the project area is a highly developed urban-suburban area including an international airport, local and interstate highways, and significant commercial/recreational boat traffic. Air quality and noise levels are already elevated and an incremental increase in boat traffic will be negligible comparatively.

5.3 Water Quality

5.3.1 Surface Water

A 1990 Corps study (Kasul et al., 1990) indicated that the dissolved oxygen level at the deepest area of the proposed Gunston Cove placement site was 11.1 milligrams per liter (mg/l) at both the surface and the bottom, suggesting that surface and bottom waters were well mixed with no vertical stratification. Water velocity at the time of these measurements was approximately 1.0 ft/sec at the surface, with no detectable current in the mid-column or near the bottom. A 1992 study of the deep holes in the Potomac River (conducted by the U.S. Army Corps of Engineers Waterways Experiment Station) indicated that, at times, the deeper areas of the Potomac are erosional. For example, the banks adjacent to the proposed placement site are eroding, which may indicate that the historic stream channel is migrating. The frequency of the stream discharges that would cause bank erosion (extreme freshwater inflow or tides) is low (USACE Memorandum, 1992). The bed materials sampled from the site were fine-grained clays and silts (USACE Memorandum, 1992). The presence of fine-grained materials at this site would indicate that the area is either depositional or that the fine-grained materials that have sloughed into the hole from the banks are remaining in place.

A Corps analysis of the sediments to be dredged indicates that the sediments to be placed are cohesive. The sediment will be dredged as large masses of material by the mechanical dredge. This material will be taken by split-hull barge to the placement site and is likely to remain as a large mass as it is released through the bottom of the barge and descends to the river floor. Sediment analysis also indicates that the sediments are plastic, and will increase in strength over time as they remain in the placement site. Studies of the placement site and other deep areas of the Potomac River in the early 1990's indicated very low dispersion and erosion potential for dredged material in the deep holes (USACE Memorandum, 1992). Dredging activities will likely cause minor turbidity in the immediate dredging and placement areas due to the physical disturbance of the sediments.

Physical and chemical testing was performed on the sediments in accordance with the U.S. Corps of Engineers and Environmental Protection Agency document "Evaluation of Dredged Material proposed for Discharge in Waters of the U.S. Testing Manual." Bulk chemistry analysis was conducted to determine the amount of metals; nutrients and other potential contaminants associated with the dredged material. Results are presented in Appendix E. The material is considered acceptable for overboard placement in accordance with Spoil Disposal Criteria for Maryland Water (MD DNR, 1975). The State of Maryland issued a water quality certification for the project based on a review of sediment quality data provided by the Corps.

Nitrogen (N) and phosphorous (P) releases are of concern within the Chesapeake watershed. Nutrient release is less of a concern during winter placement (Oct-Feb) because the water is oxygen saturated at cooler temperatures and biological activity is lower. Phosphorous is tightly bound to sediment under aerobic conditions and is generally released under anaerobic conditions. Data collected (1992) from the placement site during the summer indicates adequate oxygen on

the bottom and anaerobic conditions do not exist, therefore phosphorous release should not be a problem.

When sediment is disturbed, dredged, or moved, nitrogen is disassociated from the sediment and N from the interstitial waters is released. The dredging and placement of up to 564,000 cy of dredged material into the Gunston Cove site will cause N to be released. The material is expected to be mechanically dredged and placed within the site by a bottom-releasing scow. Dredged material tends to remain cohesive when mechanically dredged, which reduces the amount of material exposed to the water and thus the disassociation potential. The material will descend through the water column and most will settle on the bottom. During descent, N will be released into the water column.

An elutriate test predicts the amount of a substance that is released during placement of hydraulically dredged material (Groundwater and Environmental Services, INC 1999, Appendix E). The test was performed on sediment from the Mattawoman channel which is similar to the material from the other channels.

The results of the elutriate tests (3 samples) indicate a range of 0.748 to 2.13 mg/l (milligrams per liters) with a mean of 1.3 mg/l of Nitrogen. Since the test uses 4 liters of water to 1 liter of sediment (the same general ratio as hydraulic dredging) the results imply that about 5.2 mg of N is released per liter of dredged material. By converting mg to pounds, and liters to cys there is about 0.01 pounds of N released per cy of dredged material. Dredging 564,000 cys of material releases about 5,640 pounds of Nitrogen. Detailed computations can be found in Appendix E. The 5,640 pounds of N predicted to be released is a conservative number since the results are based on hydraulic dredging. Releases from mechanical dredging are less since the dredged material falls as a mass with less exposure to the water column than a well mixed slurry from a hydraulic discharge. If the dredging period requires 90 days to complete, the average amount of N discharged per day would be about 63 pounds.

As a comparison of the amount of nitrogen entering the system and the release expected as a result of placement, various other nitrogen sources were examined. The USGS has a monitoring station at Little Falls on the Potomac, which monitors the N loading from the water before it reaches Washington D.C. Based on data they provided, a ten year average (from 1987 to 1996) for the months of October, November, December, January and February shows that 35,653; 46,409; 86,174; 119,312; and 82,609 kg/day respectively of N enter the system. To convert to pounds you must multiply by 2.2lbs/kg. Therefore the 10-year monthly average of N entering the Potomac during the period ranges from 78,436 to 262,486 pounds of N daily. As another comparison the Blue Plains treatment plant releases between 30,000 and 35,000 pounds of N per day to the Potomac River.

Based on the analysis above, the 5640 pounds of N being released from the placement of the dredged material over a period of three months will be negligible compared to other nitrogen sources on the river and should not significantly impact water quality.

5.3.2 Groundwater

According to the scientific investigations to date, Mattawoman Channel maintenance dredging will pose no threat to groundwater supplies or groundwater quality in the region. Some of the impact assessment for this resource has already been presented in Section 4.3.2 because the description of the existing conditions is inextricably linked to a discussion of previous dredging activities. According to the USGS, groundwater quality in the Indian Head area has gradually changed in a zone of the aquifer that is adjacent and parallel to the Potomac River (Hiortdahl, 1997). The chemical quality of water in this zone has changed from the native sodium bicarbonate-type water with a low dissolved-solids concentration (less than 250 mg/L) to a sodium chloride-type water with a comparatively higher dissolved-solids concentration (greater than 500 mg/L). The maximum measured level of chloride and Total Dissolved Solids (TDS) was 206 ml/L and 765 ml/L, respectively (Hiortdahl, 1997). This well (Cb 34) is located only a few hundred feet from the shoreline of the Potomac and has sustained pumping rates up to 250 gal/min. The EPA Maximum Contaminant Level (MCL) for chloride and TDS is 250 mg/L and 500 mg/L, respectively.

Age testing of wells does not indicate any correlation between the saltwater intrusion (which was first noticed in the 70's) with the last dredging of the Mattawoman Channel (1965). The water pumped from the wells in 1988 began its path from the river toward the wells between 1900 and 1952, long before the 1965 dredging of the channel (Appendix D).

5.4 Vegetation

5.4.1 Upland Vegetation

There is no upland vegetation at the dredging site or placement site. Therefore, there will be no impact to upland vegetation as a result of the proposed action.

5.4.2 Submerged Aquatic Vegetation

The 1998 SAV maps indicate that the Alexandria Waterfront portion is adjacent to a large established bed of SAV. The proposed area of dredging operations is within 500 yards of this bed and other, smaller beds of SAV. Whether dredging in this location will have a significant effect on the SAV beds is dependent on two factors: time of year dredging occurs in and potential sediment transport. The impact of small amounts of sedimentation, as caused by dredging and other bottom disturbance, is smallest during the late fall and winter, when the SAV species are dormant. It is anticipated that dredging will be done within this window. Sediments landing on beds of SAV will wash away before the growing season, if the conditions are right. Small diameter lightweight sediments in an area that has seasonally high water in the spring are most likely to wash away without impacting the health or vigor of submerged species. Because of the cohesive nature of the sediments to be dredged, it is most likely that only small amounts of sediments, if any, will be deposited on the SAV beds during dredging. Material that settles in the shallow areas suitable for SAV will most likely be flushed during the spring high water. For these reasons, there will be no significant impact on SAV as a result of the proposed action.

Activity at the other channels to be dredged and the placement activity will occur more than 500 yards from SAV beds, so no SAV concerns are noted for these areas at this time.

5.4.3 Wetlands

Because no wetlands are located within the project area, there will be no impact to this resource.

5.5 Wildlife Resources

No terrestrial wildlife species are located within the channels to be dredged or the proposed placement site. Therefore, there will be no impact to terrestrial wildlife. Other potential wildlife species include waterfowl, wading birds, raptors, and shorebirds who may use the river as a forage and resting-place. Because both the proposed dredging sites and placement areas are deep, use by most birds would be incidental. Also, the proposed action will occur during the winter months so use of the project area by most bird species will be minimized. Although waterfowl do utilize Gunston Cove in winter, the birds will easily be able to leave during the periodic placement activity and return after each placement action is complete. Therefore, no significant impact to bird species is expected as a result of the proposed action.

5.6 Aquatic Resources

5.6.1 Fisheries

Monitoring of prior Corps dredging projects have indicated that free-swimming juvenile and adult fish and crabs are usually able to avoid a clamshell dredge and placement activities. Further, placement will occur in winter before the resident and anadromous species in the lower Potomac spawn, so the vulnerable early lifestages will not be in the river during the proposed action. Therefore, there should be no significant effect on these species as a result of the proposed action.

Although the deep hole proposed for material placement lies within the spawning range of several species of regional importance, is not a known spawning or nursery area. In general, most of the fish species of concern in the Potomac (basses, herring, shad) utilize shallow areas for spawning/nurseries. For example, the shallow water near the water's edge and along the Alexandria Waterfront project segment is used as spawning and nursery area, especially near SAV beds. Dredging activities will be restricted to the winter months, when anadromous fish spawning does not occur, so the proposed action should have no significant impact on fish spawning. Fisheries utilization of the placement area will be monitored before, during, and after placement (Section 7).

Most fish in the project area may be affected by loss of food if benthic species are removed or covered by sediments. However, some of these fish are planktivores, and so do not rely on benthic species for their food. Moreover, benthic macroinvertebrate recolonization is expected to start immediately and progress quickly during the spring benthic reproductive period.

The potential for increased frequency of boat wakes resuspending sediments and impacting water quality and fisheries in the long term was raised as an issue during the public comment period.

The current commercial activity is somewhat lower now than it has been previously due to the controlling depths. Increased commercial vessel activity is expected, although it is unknown whether it will exceed previous levels. The area already undergoes significant wave activity, and much of the shoreline is already stabilized within the study area. It is anticipated that the incremental increases in boat traffic will not result in increased wake induced erosion. Furthermore, the lower Potomac is already a very dynamic and often (naturally) turbid river. The species that live there are adapted to a highly dynamic system. It is very unlikely that, if increased wake action does occur from increases in boat traffic, there will be a measurable effect on aquatic resources.

5.6.2 Benthics

Approximately 7 miles of channel are proposed for dredging. All of the benthic organisms in these channels down to the project depth will be removed by clamshell dredge and will be deposited in a deep hole or other placement site. This will cause temporary, site-specific reductions in benthic abundance at the dredging locations. Benthic organisms will adapt and are expected to recolonize in a short period of time following completion of the project. Further, the species found by the George Mason University researchers adjacent to the placement area (oligochaetes, chironomids) are very adaptable, pioneering-type organisms that are expected to recolonize the placement area quickly. Benthic recolonization of the placement area will be monitored before, during, and after placement (Section 7).

5.6.3 Commercially Important Species

5.6.3.1 Blue Crab

Because the blue crab does not spawn or overwinter in the portion of the Potomac River to be dredged, it is unlikely that the proposed action will have a significant effect on this species. Some temporary loss of the benthic food source is expected within the dredged areas.

5.6.3.2 Striped Bass

Because striped bass spawn in the spring and the dredging activities will be limited to the winter months, there will be no impact on striped bass spawning as a result of the proposed action. Further, striped bass prefer to spawn and develop in areas that are shallower than those within the project area. Part of the striped bass food source will be disturbed with the benthic disturbance but it is anticipated that striped bass will temporarily forage in other areas until benthic populations are restored.

5.6.3.3 White Perch

Because white perch spawn in the spring, and the dredging activities will be limited to the winter months, and the substrate in the channels and proposed placement site is not suitable for spawning, there will be no impact on white perch spawning as a result of the proposed action. Part of the white perch food source will be disturbed with the benthic disturbance, but it is anticipated that the perch will temporarily forage in other areas until benthic populations are restored.

5.6.3.4 Largemouth Bass

Because largemouth bass spawn in the spring/summer and the dredging activities will be limited to the winter months there will be no impact on their spawning as a result of the proposed action. Further, largemouth bass prefer to spawn in shallower depths than those within the project area. Part of the largemouth food source may be temporarily disturbed with the benthic disturbance but it is anticipated that the bass will forage in other areas until benthic populations are restored.

5.6.3.5 River Herring and American Shad

Herring and shad are anadromous species and will not be in the river during the proposed action. These species are also predominantly planktivores, so little disturbance in food availability is expected. No impacts to these species are expected from the proposed action.

5.6.4 Essential Fish Habitat

Coordination between the Corps and the National Marine Fisheries Service (NMFS) (Goodger, pers. comm., 26 March 1999) indicated that, because of the low salinity in the project area, it would not be considered EFH for bluefish, summer and winter flounder, or other predator species covered under EFH, because these species are unlikely to venture in the area. Striped bass (rockfish) are not covered under this Act. NMFS indicated that this portion of the Potomac River could provide EFH for Alosids (such as alewife, Atlantic menhaden, and blueback herring) which, although they are not listed species under the Act, are common forage fish for bluefish and other species. NMFS has indicated that it would likely impose seasonal restrictions on dredging activities to protect critical life stages of these forage species. It is anticipated that dredging will occur between October 1 and February 15. Monitoring of the placement of dredged material will take place during and after this activity.

5.7 Threatened and Endangered Species

The U.S. Army Corps of Engineers, Baltimore District, in cooperation with the U.S. Fish and Wildlife Service, has completed the first year of its two-year biological survey to determine the presence of the SNS (*Acipenser brevirostrum*) within the proposed project area. The survey has included the proposed Gunston Cove placement site, and a determination of the importance of this site to the SNS. According to the available biological survey information presented to date, no sturgeon were found in the project area and no impacts on the species are anticipated. NMFS in a letter dated July, 8, 1999, has agreed that the project is not likely to adversely affect the endangered SNS (Appendix A).

Bald eagles, a federally threatened species, nest throughout the Potomac watershed. Several nests were noted in the vicinity of Gunston Cove/Mason Neck area (Appendix F). The most significant potential disturbance to this species would be during breeding/nesting season. The proposed action will not occur during this critical period and therefore will not disturb nesting eagles.

5.8 Prime and Unique Farmlands

No prime or unique farmland soils are present; therefore, there will be no impact to this resource.

5.9 Wild and Scenic Rivers

No nationally or state designated Wild or Scenic Rivers are located at or near the project area; therefore, there will be no impact to this resource.

5.10 Cultural Resources

Dredging actions for the Alexandria, Hunting Creek, and Mattawoman sites in the Potomac River project will be conducted in areas that have been dredged in the past. The horizontal and vertical dimensions of the channel will not be changed or reconfigured. Previous dredging would have removed or destroyed submerged cultural resources in those areas, so there is no potential for submerged historic properties in the area of potential effect related to these project sites. The Gunston Cove placement site will receive approximately 5-6 feet of dredged material that may cover potential submerged cultural resources. The Maryland Historic Trust has reviewed its files and indicated that the proposed project is unlikely to affect significant historic and archeological properties (Appendix A). The Maryland Historic Trust has also determined that covering submerged cultural resources with the dredged material would serve to preserve and protect those resources, if they exist.

The Potomac is an American Heritage River. As such, there are significant historic attractions along its banks. Because the proposed action will occur during the period of least tourist activity in the area, the potential impacts to historic tourism will be minimal. Some of the historic resources of the Alexandria, Virginia and Washington, D.C., area are centered around its maritime traditions. The proposed action will restore the Federal Navigation Channel to the authorized depths, which is expected to enhance the potential for some historic maritime activities to the area (Alexandria Seaport Foundation letter, Appendix A).

The potential for increased frequency of boat wakes causing increased shore erosion and potentially endangering historic resources was raised as an issue during the public comment period A previous Corps investigation of the lower Potomac River Basin noted wave-induced erosion in some places (USACE July 1997). The current commercial activity is somewhat lower now than it has been previously because of the controlling depths. Increased commercial vessel activity is expected, although it is unknown whether it will exceed previous levels. The area already undergoes significant wave activity and much of the shoreline is already stabilized within the study area. It is very unlikely that wave activity will increase to a level that will exceed current wave action levels and threaten historic resources beyond the current erosional threat.

5.11 Hazardous, Toxic, and Radioactive Substances

A review of the Comprehensive Environmental Response and Liability Information System (CERCLIS), Toxic Release Inventory System (TRIS), and the Resource Conservation and Recovery Information System (RCRIS) databases did not identify sites existing within the proposed project area. The dredging contractor will be responsible for adhering to all Federal, state, and local regulations and laws, and will adhere to fueling and operation Best Management Practices to reduce or prevent the likelihood of a release of oil or other contaminants into the water.

5.12 Sediment Quality

As discussed previously, chemical analyses indicated that PCBs and other organic contaminants were below detectable levels. Metals were detected at low levels in all sediments (Appndix E). The material is considered acceptable for overboard placement in accordance with Spoil Disposal Criteria for Maryland Water (MD DNR 1975). There isa measurable amount of arsenic in the sediments to be dredged. This arsenic ranges between 5.2 to 10.1 mg/kg. A composite sediment sample taken at the proposed Gunston Cove placement area indicated an arsenic level of 9.1mg/kg. Thus, the sediments to be dredged have arsenic levels comparable to those in the placement site. Therefore, the dredging and placement of this sediment will not release unnaturally high levels of arsenic into the environment. There are no other significant levels of contamination within the sediment to be dredged. Therefore, it is highly unlikely that the proposed action will result in adverse impacts to sediment quality at the placement site or water quality within the Potomac River. Potential nutrient impacts from sediment placement have already been detailed in Section 5.3.1.

The low moisture content, cohesiveness, and plasticity of the sediments proposed for dredging and placement will tend to make them consolidate and gain strength over time within the placement area. Mechanical dredging and barge placement will aid in keeping sediments consolidated, so there is little potential for material drift from the site both initially (during placement) and long-term (due to erosion). Studies of the placement site and other deep areas of the Potomac River in the early 1990's indicated very low dispersion and erosion potential for dredged material in the deep holes (USACE, 1992). Nevertheless, bottom sediment spread at the placement site will be monitored before, during, and after placement (Section 7).

5.13 Infrastructure

The numerous public, private, and proprietary utilities existing in the greater Washington, D.C. metropolitan area rely on aboveground and buried cable and pipelines to extend services to all of their customers. There is the possibility that telephone and other communications cables, natural gas lines, water and sewer lines, and power cables exist within the Potomac River bottom sediments. While the individual utilities companies will likely have maps showing the locations and depths of these items, some proprietary systems may not be shown on such maps. Close coordination with agencies maintaining proprietary systems will be maintained by the dredging contractor to ensure service is not interrupted.

The proposed project will restore the authorized project depth to the Federal Navigation Channel, therefore improving the channel depths that sustain waterborne commerce within greater Washington metropolitan area.

The proposed action will not hamper emergency or medical services in any way. The primary activity of the proposed action will occur within the existing Federal Navigation Channel, which is not used for fire, rescue, or police services. The placement activity will occur at the western edge of the river, which is also not a thoroughfare for these activities.

The proposed action will result in temporary increases in noise at the dredging and placement sites. The noise will be consistent with the commercial nature of the channel. It will not impose any additional significant levels of noise; therefore, there will be no significant noise impacts as a result of the proposed action.

5.14 Socioeconomic Conditions

Dredging the Federal Navigation Channel to its authorized depth will allow for safe navigation of ships carrying maximum draft within the project area, and decrease the transit time and costs associated with limiting drafts, tide levels, and turns. The proposed project would also allow those vessels to safely navigate along critical stretches of the project area at all times, thereby causing a significant beneficial economic impact to the greater Alexandria, Virginia and Washington, D.C., metropolitan area.

Recreational anglers within the project area could experience temporary, minor impacts due to temporary fish displacement while dredging operations are conducted within the channel and Gunston Cove placement area. However, the timing of this project during cold-weather months will minimize this impact.

5.15 Environmental Justice

The dredging activities associated with the proposed action will occur within the existing Potomac River Federal Navigation Channel and Gunston Cove. The dredge vessel and barge will not be incongruous with the normal boat traffic in the area. The dredging will therefore not cause an aesthetic or physical impact on any longshore communities. Staging areas will not be located within a residential area. No low-income or minority communities exist within close proximity of the proposed project area. The proposed action does not preferentially benefit any demographic group to the detriment of any other.

5.16 Cumulative Impacts

The impacts of the current proposed action must be weighed with the additive effects of other actions in the project area to determine whether these actions will result in a significant cumulative impact on the natural and human environment of the area.

The current proposed dredging is part of a larger authorized project. The remaining segments of the Potomac River Federal Navigation Channel will be considered for dredging within the next 5 years. Quantities and placement sites have not yet been determined. However, the quantity of material is likely to be at least 1.0 million cy based on the length and current depth of the remaining channels. Locations for the placement of material from these channels will depend on the chemical and physical qualities of the sediments and the sites available for use. The 1988 Corps report identified five potential open-water placement sites, two beneficial use sites, and two upland placement sites that could be used for this material.

Other activities in the area that could add to a cumulative environmental impact include dredging of the Columbia Island Marina at Alexandria, Virginia (100,000 cy), and the WSM at Arlington, Virginia (30,000 cy). Efforts are also underway to create wetland habitat at Kingman Lake,

Washington, D.C., and to open spawning area for anadromous fish above Little Falls, Virginia. The Woodrow Wilson Bridge (I-95), adjacent to the Alexandria Waterfront segment, is scheduled to be rebuilt over the next 10 years. As part of this effort, approximately 500,000 cy of sediments will be dredged to provide necessary access for way for the new bridge construction. This material will be placed at an as-yet-undetermined location, and will directly impact 20+ acres of hydrilla (*H. verticillata*). A compensatory mitigation plan is being developed.

Each dredging project in the area results in periodic turbidity and possible disturbance of fish and other aquatic organisms. Depending on the location to be dredged and the placement site, some disturbance of wildlife may also occur during these projects. Wilson Bridge reconstruction effects may overlap slightly with the effects of the current proposed action. This is because these actions are scheduled to be 1 year apart in time. The anticipated scenario is that the Federal Navigation Channel dredging will have been completed for over 6 months by the time the Wilson Bridge dredging occurs. This will allow time for any turbidity from the current proposed action to disperse, and the individual fish and wildlife to return to the area before the bridge dredging begins. There may be some overlap in the form of small amounts of sediment transport from the Gunston Cove placement site and the bridge dredging site. This effect is not anticipated to be significant, however.

The wetland habitat creations at Kingman Lake and the fish passage at Little Falls will help to mitigate the negative effects of other planned projects by providing high-quality habitat for wetland species and anadromous fish, respectively.

In summary, no significant cumulative impacts are anticipated for the proposed project.

6.0 CONCLUSIONS

It is anticipated that the effects of the proposed project are not significant either individually or as part of a cumulative effect with other actions. Anticipated short-term effects of the proposed action include minor air emissions due to operation of dredging equipment, burial of existing sediments at the material placement site, temporary turbidity in the immediate area of dredging and placement, temporary displacement of fish species and removal of sessile aquatic organisms from the channel, and a minor temporary increase in noise from the operation of barges and the dredge. No significant long-term negative impacts were identified. Long-term positive impacts include improved navigation from Indian Head to the Alexandria Waterfront and potential improvements to fish habitat. It is anticipated, according to the Corps' engineering analysis, that the placement of sediment within Gunston Cove should form cohesive mounds, thus enhancing fish habitat. Dredging is anticipated to occur between October 1 and February 15, and monitoring of the placement of this material will take place before, during, and after the work is complete (Section 7). Environmental investigation of the proposed placement site indicates that no SNS are found in that area of the Potomac River, and no other fish species use the site preferentially for overwintering. NMFS in a letter dated July 8, 1999, concluded that the proposed action will not likely adversely affect the endangered SNS.

7.0 MONITORING FRAMEWORK

The Section 401 Certification as well as comments from several resource agencies suggested monitoring of various resources to document post-placement recovery. Specific elements of a monitoring plans are currently under review by the governing agencies. The monitoring plan will consist of the evaluation of (1) sediment spread, (2) benthic macroinvertebrates, (3) water quality (including nutrient release), and (4) fisheries utilization. Monitoring will be performed before, during, and after the proposed action.

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